In the claims:

1. (Presently Amended) A multi-reflective acoustic wave device comprising:

a substrate having at least one layer of piezoelectric substance having at least a first surface capable of guiding an acoustic wave, and at least a second surface opposite to said first surface;

an electromechanically significant reflective grating deposited on said first surface having a length along its longitudinal axis, said length defining longitudinal extents of an area supporting acoustic waves, wherein said active area is covered on at least 60% of its longitudinal dimension by electromechanically active transducer elements of said reflective grating, said elements being spaced at substantially periodic intervals commensurating with the wavelength of said acoustic wave;

the electromechanically active transducer elements forming an input transducer, and an output transducer, each transducer integrated into said reflective grating, and comprising a plurality of interdigitated electrodes connected in a periodic sequence to a plurality of electrical nodes;

said input transducer adapted to induce an acoustic waves, said acoustic wave having a frequency and a vector substantially perpendicularly to said electrodes and in the plane of said first surface;

wherein said reflective grating is locally continuous and periodic, and constructed to create an electromechanically significant reflective coupling between the forward and a reverse traveling acoustic wave induced in the piezoelectric substance.

2. (Original) A multi-reflective acoustic wave device as claimed in claim 1, wherein said reflective grating or a portion thereof comprises a plurality of essentially

periodically repeating subgroups.

3. (Original) A multi-reflective acoustic wave device as claimed in claim 2, wherein said subgroups are independently weighted.

4. (Original) A multi-reflective acoustic wave device as claimed in claim 1 wherein each of at least the majority of the elements of said reflective grating provides a reflectivity (κ/K_T) of at least 0.1%.

5. (Original) A multi-reflective acoustic wave device as claimed in claim 1, wherein said reflective grating further comprises a substantially periodic, electrically inactive reflective structure interposed between said input and output transducers.

6. (Original) A multi-reflective acoustic wave device as claimed in claim 5, wherein said reflective structure having a length of between 25 and 150 of said periodic intervals.

7. (Original) A multi-reflective acoustic wave device as claimed in claim 5 wherein said reflective structure comprises corrugations in said piezoelectric substance.

8. (Original) A multi-reflective acoustic wave device as claimed in claim 1, wherein said reflective grating having at least one periodicity variation to introduce a offset in the phase shift between a signal coupled to said input transducer and a corresponding signal induced in said output transducer.

9. (Original) A multi-reflective acoustic wave device as claimed in claim 1, wherein at least a portion of said reflective grating comprises metal electrodes deposited on said substrate.

10. (Original) A multi-reflective acoustic wave device as claimed in claim 1, wherein at least a portion of said reflective grating comprises dielectric material deposited on said substrate.

11. (Original) A multi-reflective acoustic wave device as claimed in claim 1,wherein at least a portion of reflective grating comprises grooves cut in said substrate.

12. (Original) A multi-reflective acoustic wave device as claimed in claim 1, wherein

said input transducer is a bidirectional transducer having substantially symmetrical coupling to forward and reverse acoustic waves.

13. (Original) A multi-reflective acoustic wave device as claimed in claim 1, wherein said input transducer is a unidirectional transducer having asymmetrical coupling to forward and reverse acoustic waves.

14. (Original) A multi-reflective acoustic wave device as claimed in claim 1, wherein said transducer having a length greater than or equal to 50 of said periodic intervals.

15. (Original) A multi-reflective acoustic wave device as claimed in claim 1, wherein said transducer having a length greater than or equal to 200 of said periodic intervals.

16. (Original) A multi-reflective acoustic wave device as claimed in claim 1, wherein said transducer having a dispersion curve having a stopband between 0.2% and 2% of the nominal design center frequency.

17. (Original) A multi-reflective acoustic wave device as claimed in claim 1, further comprising a propagation path interposed between said input and output transducers.

18. (Original) A multi-reflective acoustic wave device as claimed in claim 1, further comprising an amplifier circuit coupled between said input and output transducers to form an oscillator.

19. (Original) An acoustic wave device based sensor comprising:

    an acoustic wave device as claimed in claim 1, further comprising a sensing face in mechanical communication with said substrate;

    an oscillator circuit having an output coupled to said input transducer;

    a sensing circuitry having an output, and an input coupled to said output transducer for sensing at least one parameter of a signal derived from said output transducer.

20. (Original) An acoustic wave device based sensor as claimed in claim 19, wherein said measuring circuitry comprises a comparator circuitry for detecting differences between the output of said oscillator and the output of said sensing circuitry, for detecting differences therebetween, said differences being influenced by exposure of said sensing face to a sensed substance.

21. (Original) An acoustic wave device based sensor as claimed in claim 20, wherein an output from said output transducer is coupled to said oscillator for providing feedback.

22. (Original) An acoustic wave device based sensor as claimed in claim 20, wherein said sensing circuitry and said oscillator are integrated.

23. (Original) An acoustic wave device based sensor as claimed in claim 20, wherein said comparator is adapted to measure phase difference.

24. (Original) An acoustic wave device based sensor as claimed in claim 20, wherein said comparator is adapted to measure power absorption between said input and output transducers.

25. (Original) An acoustic wave device based sensor as claimed in claim 24, further comprising a temperature compensated diode detector, for detecting said power absorption.

26. (previously presented) An acoustic wave device based sensor as claimed in claim 20, wherein said comparator is adapted to measure frequency change of said oscillator, induced by changes in the delay time of a signal inputted into said input transducer and outputted from said output transducer.

27. (Original) An acoustic wave device based sensor as claimed in claim 20, wherein said comparator is adapted to measure any combination of at least two parameters elected from a list of parameters consisting of phase, frequency, power, voltage, and current.

28. (Original) An acoustic wave device based sensor as claimed in claim 20, wherein

said sensing face is deposited on said second surface.

29. (Original) An acoustic wave device based sensor as claimed in claim 20, further comprising a coating deposited on said sensing face.

30. (Original) An acoustic wave device based sensor as claimed in claim 29, wherein said coating comprises material selected from a list consisting of an enzyme, an antibody, a nucleic acid, an antigen, or a combination thereof.

31. (Original) An acoustic wave device based sensor a claimed in claim 20, wherein an output from said output transducer is coupled to said oscillator for providing feedback.

32. (Original) An acoustic wave device based sensor as claimed in claim 19, wherein said sensing circuitry and said oscillator are integrated.

33. (Original) An acoustic wave device based sensor as claimed in claim 19, wherein said sensing face is deposited on said second surface.

34. (Original) An acoustic wave device based sensor as claimed in claim 19, wherein said comparator is adapted to measure any combination of at least two parameters elected from a list of parameters consisting of phase, frequency, power, voltage, and current.

35. (Original) An acoustic wave device based sensor as claimed in claim 19, wherein said sensing face is adapted for exposure to liquid or gas in a manner allowing damping of a signal propagated within said substrate.

36. (Original) An acoustic wave device based sensor as claimed in claim 19 further comprising an intermediate layer deposited on said substrate, wherein said sensing face comprises a face of said intermediate layer.

37. (Previously presented) An acoustic wave device based sensor as claimed in claim 19, further comprising a passivation layer deposited on said sensing face.

38. (Original) An acoustic wave device based sensor as claimed in claim 19, further comprising a substance sensitive layer on top of said sensing face, said substance

sensitive layer is being chemically structured to change at least one physical property thereof responsive to presence of predetermined molecules or molecule groups.

39. (Original) An acoustic wave device based sensor as claimed in claim 19, further comprising a coating deposited on said sensing face.

40. (Original) An acoustic wave device based sensor as claimed in claim 39, wherein said coating comprises material selected from a list consisting of an enzyme, an antibody, a nucleic acid, an antigen, or a combination thereof.

41. (Original) An acoustic wave device based sensor as claimed in claim 19 further comprising temperature compensation circuitry for compensating measured parameters in accordance to temperature.

42. (Original) An acoustic wave device based sensor as claimed in claim 19 further comprising temperature compensation software, for compensating measured parameters in accordance to temperature.

43. (Original) A sensor tolerant of viscous dampening comprising:

    an acoustic wave device as claimed in claim 1, further comprising a sensing face in mechanical communication with said substrate;

    an oscillator circuit having an output coupled to said input transducer;

    a first diode detector electrically coupled to the input transducer, and a second diode detector electrically coupled to said output transducer, for providing power sensing .

44. (Original) A sensor as claimed in claim 43, wherein said diode detectors are temperature compensated.

45. (Original) A sensor as claimed in claim 43 further comprising a temperature sensor to sense ambient temperature.

46. (Original) A sensor as claimed in claim 43 further comprising a voltage regulator.

47. (Original) A sensor as claimed in claim 43 wherein said acoustic wave device acts as a portion of a feedback loop for said oscillator.

48. (Original) A sensor as claimed in claim 43 wherein said sensing face is said second surface or a portion thereof.

49. (Original) A sensor as claimed in claim 48, and further comprising an intermediate layer between said sensing face and a liquid to be measured.

50. (Original) An acoustic wave device based sensor as claimed in claim 43, further comprising a coating deposited on said sensing face.

51. (Original) An acoustic wave device based sensor as claimed in claim 50, wherein said coating comprises material selected from a list consisting of an enzyme, an antibody, a nucleic acid, an antigen, or a combination thereof.

52. (New) A multi-reflective acoustic wave device as claimed in claim 1, wherein said active area is covered on at least 67% of its longitudinal dimension by electromechanically active transducer elements of said reflective grating.

53. (New) A multi-reflective acoustic wave device as claimed in claim 1, wherein said active area is covered on at least 70% of its longitudinal dimension by electromechanically active transducer elements of said reflective grating.

54. (New) A multi-reflective acoustic wave device as claimed in claim 1, wherein said active area is covered on at least 77% of its longitudinal dimension by electromechanically active transducer elements of said reflective grating.

55. (New) A multi-reflective acoustic wave device as claimed in claim 1, wherein said active area is covered on at least 80% of its longitudinal dimension by electromechanically active transducer elements of said reflective grating.

56. (New) A multi-reflective acoustic wave device as claimed in claim 1, wherein said active area is covered on 100% of its longitudinal dimension by electromechanically active transducer elements of said reflective grating.